

BERAC
June 27, 2013

**Sharlene Weatherwax, Associate Director of Science
Biological and Environmental Research**



U.S. DEPARTMENT OF
ENERGY

Office
of Science

Office of Biological
and Environmental Research

Office of Science FY 2014 Budget Request to Congress

(B/A in thousands)

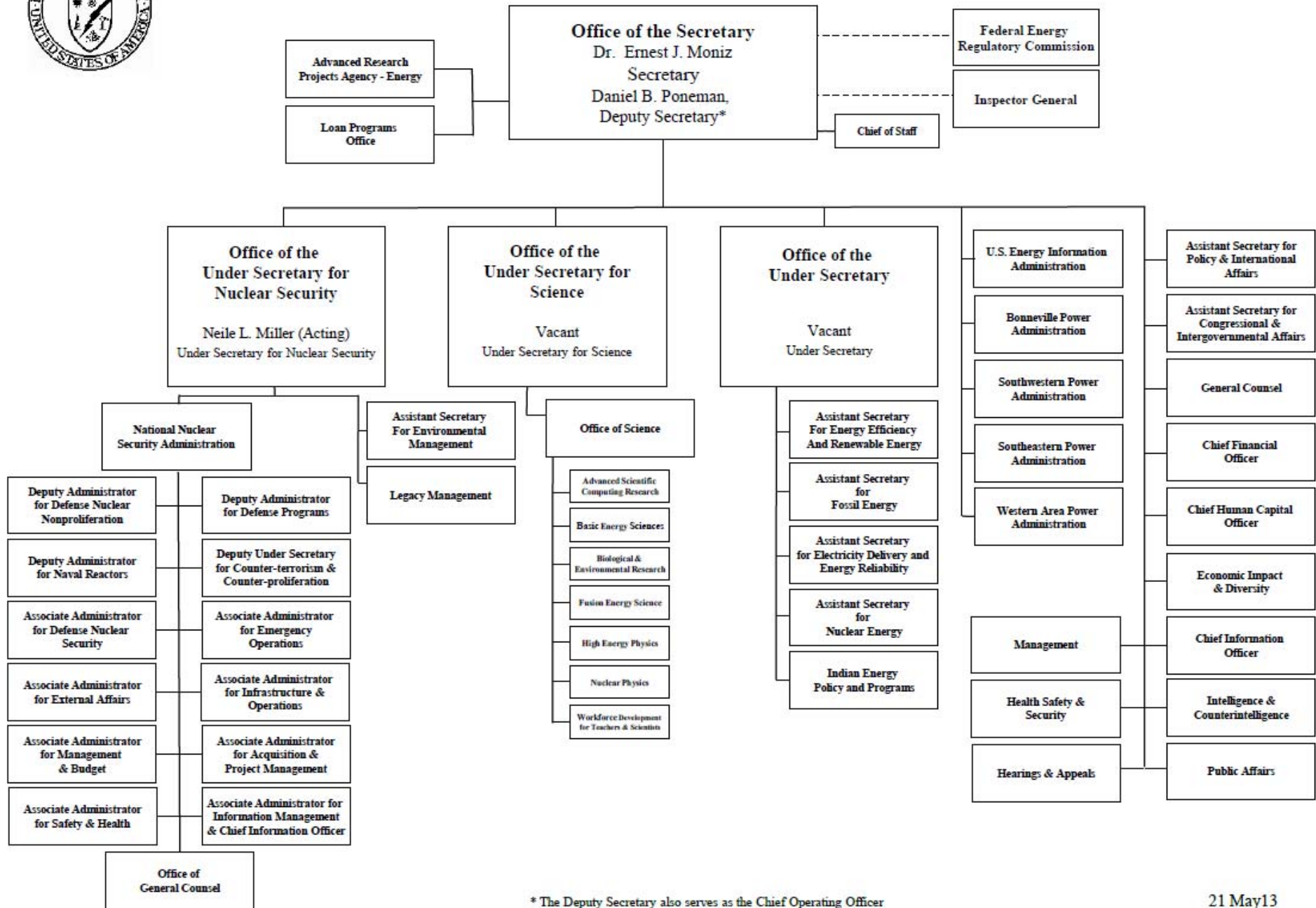
	FY 2012		FY 2013	FY 2014		
	Enacted Approp.	Current Approp.	Annualized CR (per budget)	FY 2014 President's Request	FY 14 President's Request vs. FY 12 Enacted Approp.	
Advanced Scientific Computing Research	440,868	428,304	443,566	465,593	+24,725	+5.6%
Basic Energy Sciences	1,688,093	1,644,767	1,698,424	1,862,411	+174,318	+10.3%
Biological and Environmental Research	609,557	592,433	613,287	625,347	+15,790	+2.6%
Fusion Energy Sciences	400,996	392,957	403,450	458,324	+57,328	+14.3%
High Energy Physics	790,860	770,533	795,701	776,521	-14,339	-1.8%
Nuclear Physics	547,387	534,642	550,737	569,938	+22,551	+4.1%
Workforce Development	18,500	18,500	18,613	16,500	-2,000	-10.8%
Sciences Labs infrastructure	111,800	111,800	112,485	97,818	-13,982	-12.5%
Safeguards & Security	80,573	80,573	81,066	87,000	+6,427	+8.0%
Program Direction	185,000	185,000	186,132	193,300	+8,300	+4.5%
SBIR / STTR		114,125				
Subtotal, Science	4,873,634	4,873,634	4,903,461	5,152,752	+279,118	+5.7%

Highlights of the FY 2014 Office of Science Budget

- Research for clean energy
 - \$69 million has been added to EFRC funding to fully fund a number of EFRCs, all of which will be recompleted in FY 2014
 - Bioenergy Research Centers are fully funded
 - The Fuels from Sunlight Hub (Joint Center for Artificial Photosynthesis) and Energy Storage Hub (Joint Center for Energy Storage Research) are fully funded
- Facility operations
 - Most of the scientific user facilities operate at or near optimal levels—this includes the Leadership Computing Facilities and the light sources that together host more than half of all users at the facilities
- Construction and large MIEs
 - NSLS-II at BNL has its final year of construction funding and enters early operations
 - NOvA at Minnesota has completed construction funding and enters into full operations
 - The 12-GeV upgrade at TJNAF; LCLS-II at SLAC; APS Upgrade at ANL; Muon to Electron Conversion Experiment at FNAL all continue construction or fabrication
 - U.S. contributions to ITER continue
 - FRIB at MSU has its first construction funding
- Balance among research, facility operations, and construction
- Mindful of out-year commitments



DEPARTMENT OF ENERGY



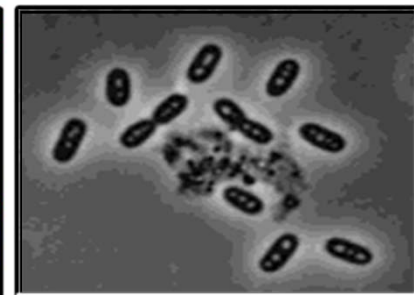
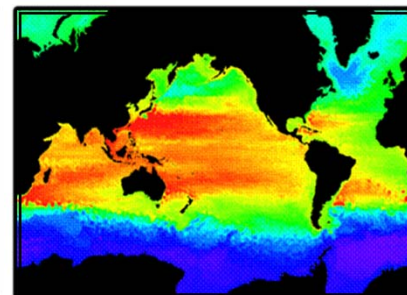
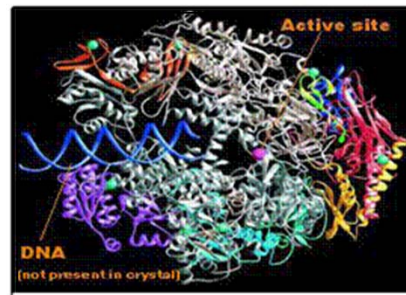
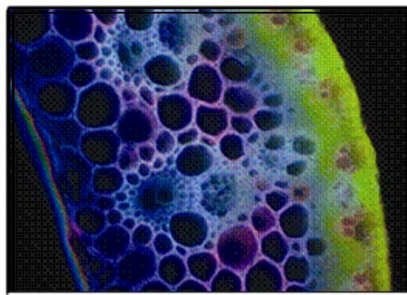
* The Deputy Secretary also serves as the Chief Operating Officer

Biological and Environmental Research

Understanding complex biological, climatic, and environmental systems across vast spatial and temporal scales

FY 2014 Budget Highlights:

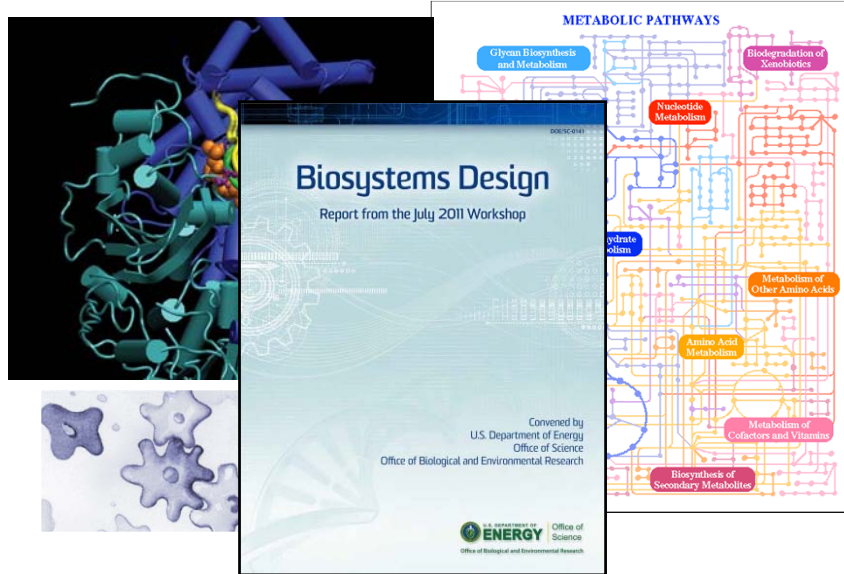
- The 3 DOE Bioenergy Research Centers are fully funded.
- Core research in Biological Systems Science supports new opportunities:
 - Development of biosystem design tools for plant and microbial systems
 - Mesoscale to Molecules—the scaling of processes from the molecular to subcellular levels
- Radiological Sciences decreases—targeted investments are made to develop radiotracer imaging techniques for bioenergy-relevant and environmental processes; some projects are completed
- Atmospheric and Terrestrial Ecosystem Research focus on the Arctic and the Tropics
 - ARM mobile facilities and NGEE projects couple field experiments, observations, and modeling
- Climate Modeling advances science for high-resolution predictability, uncertainty characterization, and adaptive software to support new physics and compatibility with next-generation HPCs.
- Scientific user facilities are funded at optimal operations.



Biological Systems Science: Core Research Opportunities

Biosystems Design Tools for Plant & Microbial Systems

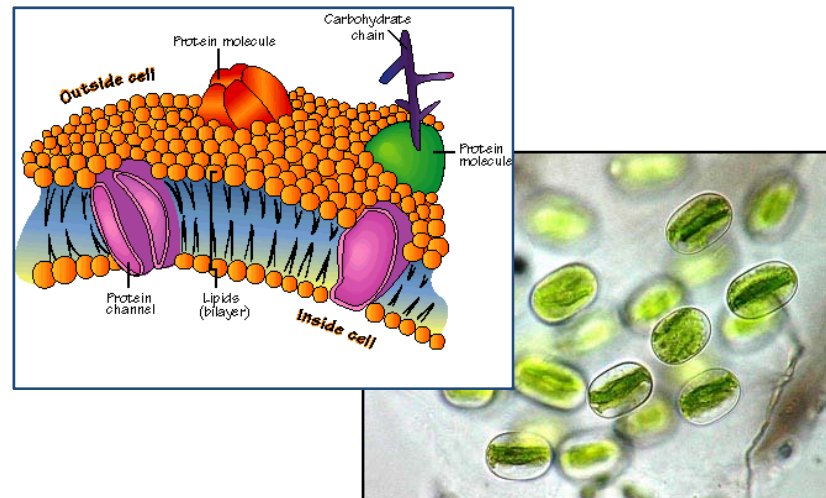
- Discovery and bioengineered redesign of plant and microbial systems advances scientific understanding and paves the way for sustainable production of biofuels and other applications.



- In FY2014, BER will build on existing testbeds and genetic toolkits, soliciting for new platform organisms, capabilities and demonstrations of bioengineering techniques.

Mesoscale to Molecules

- Central to the Biological Systems Science portfolio is understanding the translation of genomic information into the mechanisms that power living cells, communities of cells, and whole organisms.
- New research initiated will support interdisciplinary approaches understanding the genomic and physical rules governing the formation and functions of subcellular mesoscale structures. Key targets will be organelles and membranes in plants and microbes relevant to DOE bioenergy and environmental missions.



Next-generation Ecosystem Experiments (NGEE)

NGEE—projects coupling terrestrial field experiments and modeling to improve the representation of terrestrial processes in Earth system models, thereby improving the quality of climate model projections.

- Target regions are globally important, climatically sensitive, and understudied/represented in predictive models.
- Projects combine field and laboratory studies, observations, and multi-scale model simulation, coordinating with ARM mobile campaigns.
- Major campaigns: Arctic (FY2012-2022);
Tropics (FY2014-2023)
 - **Arctic** permafrost: Warming of permafrost soils will release vast amounts of CO₂ and/or CH₄ to the atmosphere—a strong positive feedback to warming. In FY 2014, Phase I activities are fully underway, with observation and modeling.
 - **Tropics** (FY 2014): Rainfall stress on tropical ecosystems and release of biogenic aerosols impact cloud condensation nuclei. In FY 2014, NGEE Tropics will initiate preliminary modeling and observations at several sites in the Tropics.



Personnel



WELCOME Kent Peters – BRC Program
Manager, BSSD



GOODBYE Susan Gregurick – Kbase Program
Manager, BSSD

Actions Pending

- CESD, Data Program Manager
- BSSD, Microbiologist
- CESD, Science Assistant
- BSSD, Science Assistant

Significant Awards to BER Researchers



Janet Braam – 2012 Cozzarelli Prize in Applied Biological, Agricultural, and Environmental Sciences, acknowledges papers that reflect scientific excellence and originality



Gary Stacey - the 2013 Mumford Outstanding Faculty Award in recognition of his excellence in research performance; national and international recognition; and special contributions to education.



Phil Rasch (PNNL) - the Community Earth System Model distinguished achievement award, for major contributions to both the Community Atmospheric Model (CAM) and aerosol science.



Jay Keasling (LBNL) – the Biotechnology Industry Organization 2013 George Washington Carver award for innovation in industrial biotechnology and **2013 Promega Biotechnology Research Award** from the American Society for Microbiology for significant contributions to the application of biotechnology through fundamental microbiological research and development.

BER Early Career Topics 2013

1. Systems Biology and Biosystems Design for Bioenergy Production by Novel Platform Organisms

- ❖ Research aimed at developing systems biology knowledge and genetic tools for the functional modification of an expanded suite of microbes and plants for sustainable bioenergy production.

2. Environmental System Science

- ❖ Research that combines measurements, experiments, and modeling that provide improved quantitative and predictive understanding of the coupled biological, chemical and physical interactions of the belowground carbon cycle processes.

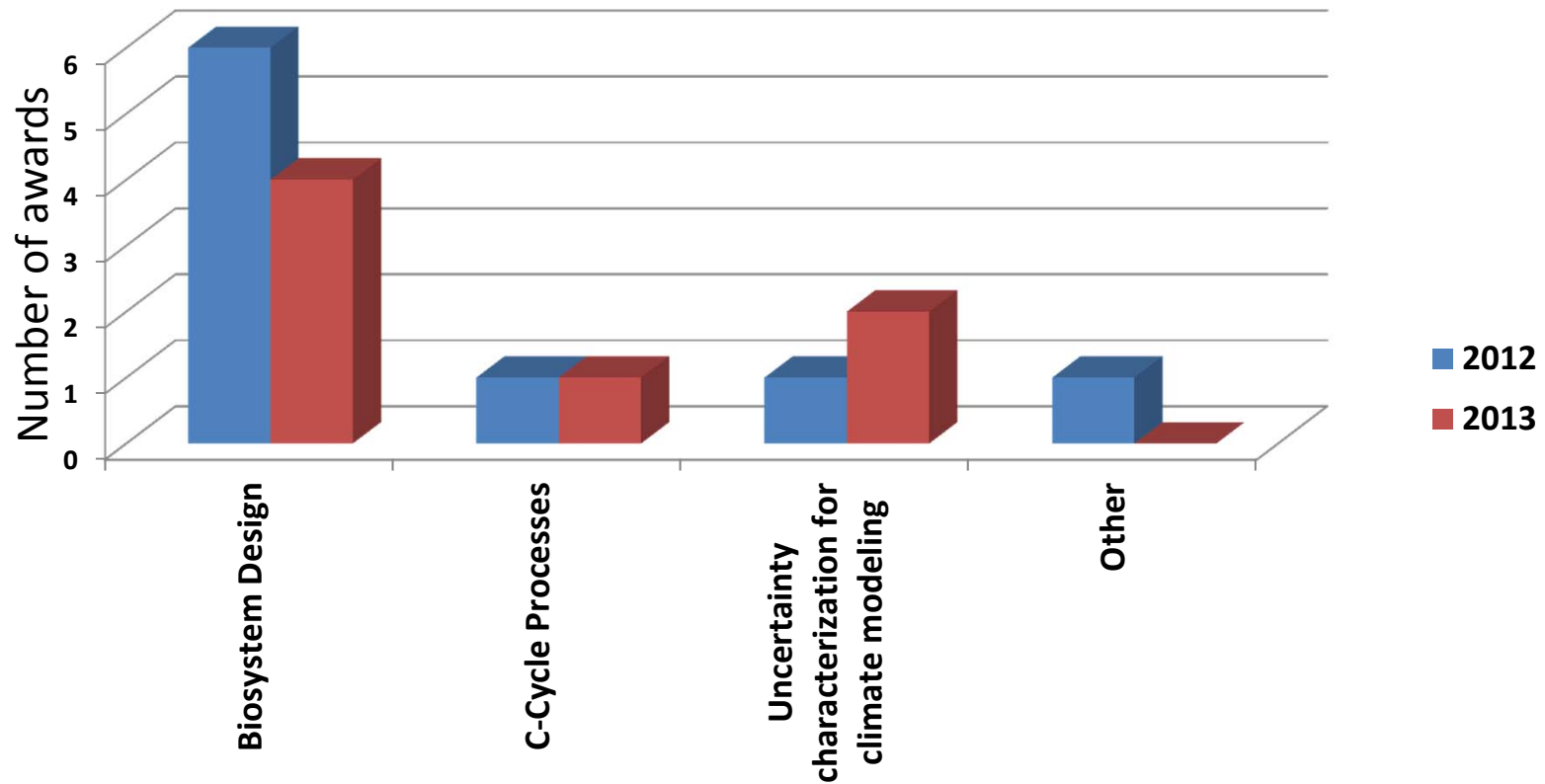
3. Uncertainty Characterization for Integrated Earth System Modeling

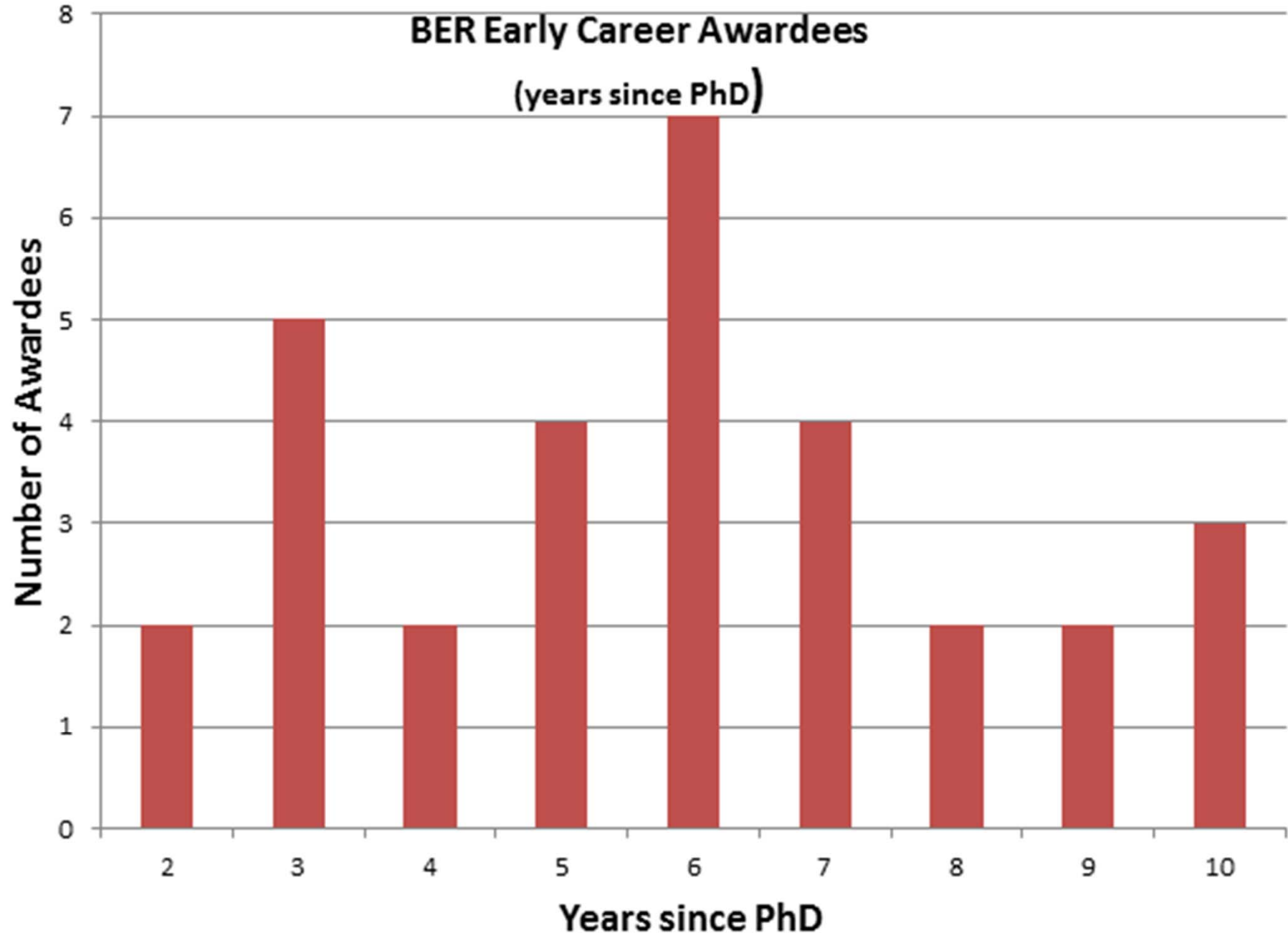
- ❖ Development of methodologies that characterize uncertainties in integrated global earth system models, by examining the components that contribute significantly to climate system and projection uncertainties.

Early Career Awards contribute to BER growth areas






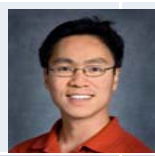

- FY 2009 & 2010 calls and awards distributed across all BER subprograms
- FY 2011 - 2013 calls and awards focused on new / growth areas in BER

Early Career Awards in BER Growth Areas





BER Awardees

Name	Institution	Topic Area	Summary
Michelle O'Malley 	UC Santa Barbara	Biosystem design	Engineering anaerobic gut fungi for lignocellulose breakdown
Brian Pflieger 	U Wisconsin Madison	Biosystem design	Engineering mRNA turnover in bacteria
Heather Coleman 	Syracuse U	Biosystem design	Extreme expression of cellulases in Poplar
Dominique Loque 	LBL	Biosystem design	Tools to engineer plant root system & improve biomass yield & carbon sequest.
Nathan Urban 	LANL	Uncertainty quantification	Combining system and model dynamics to learn about climate uncertainties
George Shu Heng Pau 	LBL	Uncertainty quantification	Multiscale reduced order method for integrated earth system modeling
Rebecca Neumann 	U Washington	Environ system science	Methane oxidation in the rhizosphere of wetland plants